CLUSTER UNIVERSITY :: KURNOOL

U.G.FIRST YEAR II SEMESTER END EXAMINATIONS APRIL 2024

Programme : **B.Sc** Subject : **Mathematics**

Paper Title : **Analytical Solid Geometry**

Time: 3 Hours Max. Marks: 70 M

## SECTION – A

**Answer any FIVE questions. Each question carries 4 marks.** **5QX4M=20M**

1) Find the equation of the plane through $(4,4,0)$ and perpendicular to the planes $x+2y+2z=5$ and $3x+3y+2z-8=0$
2) Find the distance between the planes $2x-y+3z=6$ and $-6x+3y-9z=5$
3) Find the point of intersection of the lines $\frac{x-1}{-3}=\frac{y-2}{2}=\frac{z-3}{2}$ and $\frac{x-1}{3}=\frac{y-5}{1}=\frac{z}{-5}$
4) Prove that the lines $\frac{x-3}{4}=\frac{y-2}{1}=\frac{z-1}{3}$ and $\frac{x-2}{3}=\frac{y-3}{4}=\frac{z-4}{5}$ are coplanar
5) Find the equation of the sphere of radius 3 concentric with the sphere $x^2+y^2+z^2-2x-2y-2z=1$
6) Find the equation of radical plane of the coaxial system whose limiting points are $(-1,2,1)$ and $(-2,1,-1)$.
7) Find the equation to the cone which passes through the three coordinate axes and the lines $\frac{x}{1}=\frac{y}{-2}=\frac{z}{3}$ and $\frac{x}{2}=\frac{y}{1}=\frac{z}{1}$
8) Find the reciprocal cone of $ax^2+by^2+cz^2=0$

## SECTION-B

Answer ALL questions. Each question carries TEN marks. 5QX10M=50M

9) a) A variable plane is at a constant distance $p(\neq 0)$ from the origin. It meets the coordinate axes in A, B, C. Through A, B, C planes are drawn parallel to the coordinate planes. Show that the locus of their point of intersection is $x^{-2}+y^{-2}+z^{-2}=p^{-2}$. **(OR)**

   b) Prove that the equation $2x^2-6y^2-12z^2+18yz+2zx+xy=0$ represent a pair of planes, and find the angle between them.

10) a) Find the S.D. between the lines $\frac{x-2}{3}=\frac{y-3}{4}=\frac{z-4}{5}$ and $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$. Hence show that the lines are coplanar. **(OR)**

    b) Find the perpendicular distance of the point $(-1,3,9)$ from $\frac{x-13}{5}=\frac{y+8}{8}=\frac{z-31}{1}$.

11) a) Find the equations of the spheres passing through the circle $x^2+y^2=4, z=0$ and is intersected by the plane $x+2y+2z=0$ in a circle of radius 3. **(OR)**

    b) Find the pole of the plane $x+2y+3z=7$ *w.r.t* the sphere $x^2+y^2+z^2-2x-4y-6z+11=0$.

12) a) Find the limiting points of the coaxal system defined by the spheres $x^2+y^2+z^2+4x-2y+2z+6=0$ and $x^2+y^2+z^2+2x-4y-2z+6=0$ **(OR)**

    b) Find the equation of the cone with vertex $(5,4,3)$ and $3x^2+2y^2=6, y+z=0$ as base.

13) a) Find the equation to the right circular cone whose vertex is $(3,2,1)$, axis line $\frac{x-3}{4}=\frac{y-2}{1}=\frac{z-1}{3}$ and semi vertical angle $30^0$. **(OR)**

    b) Find the equation of the enveloping cylinder of the sphere $x^2+y^2+z^2-2x+4y=1$ having its generators parallel to the line $x=y=z$.

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**Programme :B.Sc. Subject : MATHEMATICS**

**Paper Title : THREE DIMENSIONAL ANALYTICAL SOLID GEOMETRY**

**Time:3hrs** **Max Marks:75**

## Section - A

**Answer any 05 (Five) questions. Each question carries 05 marks** **5 x 5 = 25**

1. Find the equation to the plane through the points $(2, 2, 1), (9, 3, 6)$ and perpendicular to the plane $2x + 6y + 6z = 9$.
2. Find the image of the point $(1, -1, 5)$ in the plane $3x - 2y - 4z - 14 = 0$.
3. Find the equation of the plane through the origin and containing the line is $x - 3y + 2z + 3 = 0 = 3x - y + 2z - 5$.
4. Find the equation to the sphere through O (0, 0, 0) and making intercepts a, b, c on the axes.
5. Show that the plane $2x - 2y + z + 12 = 0$ touches the sphere $x^2 + y^2 + z^2 - 2x - 4y + 2z - 3 = 0$ and the point of contact.
6. Find the equation to cone which passes through the coordinate axes and the lines $\frac{x}{1} = \frac{y}{-2} = \frac{z}{3}$ and $\frac{x}{3} = \frac{y}{-1} = \frac{z}{1}$.
7. Find the equation of the enveloping cone of the sphere $x^2 + y^2 + z^2 + 2x - 2y = 2$ with its vertex at $(1,1,1)$.
8. if the axis of a right circular cylinder of radius r is the z-axis then the equation of the cylinder is $x^2 + y^2 = r^2$.

## Section - B

**Answer Any ALL Questions.** **5 x 10 = 50**

9. (a) A plane meets the coordinate axes in $A, B, C$. If the centroid of $\Delta ABC$ is $(a, b, c)$ , then show that the equation of the plane is $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 3$

**OR**

(b) Prove that the equation $2x^2 - 6y^2 - 12z^2 + 18yz + 2zx + xy = 0$ represents a pair of planes, and find the angle between them.

10. (a) Show that the lines $\frac{x-1}{2} = \frac{y+1}{-3} = \frac{z+10}{8}$; $\frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7}$ are coplanar. Also find their point of intersection and the plane containing the lines.

**OR**

(b) find the shortest distance and the equation of S.D line between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$, $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$

11. (a) A sphere of radius k passes through the origin and meets the axes in A,B,C. Show that the centroid of the triangle ABC lies on the sphere $9(x^2 + y^2 + z^2) = 4k^2$.

**OR**

(b) Show that the two circles $x^2 + y^2 + z^2 - y + 2z = 0$ , $x - y + z = 2$; $x^2 + y^2 + z^2 + x - 3y + z - 5 = 0$ , $2x - y + 4z - 1 = 0$ lie on the same sphere and finds its equation.

12. (a) Find the limiting points of coaxial system determined by two spheres whose equations are $x^2 + y^2 + z^2 + 3x - 3y + 6 = 0$ and $x^2 + y^2 + z^2 - 6y - 6z + 6 = 0$

**OR**

(b) Find the vertex of the cone $7x^2 + 2y^2 + 2z^2 - 10zx + 10xy + 26x - 2y + 2z - 17 = 0$

13. (a) Prove that the equation $\sqrt{fx} \pm \sqrt{gy} \pm \sqrt{hz} = 0$ represents a cone that touches the coordinate planes and find its reciprocal cone.

**OR**

(b). Find the equation of the cylinder whose generators are parallel to the line $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ and passes through the curve is $x^2 + y^2 = 16,\ z = 0$

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